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ABSTRACT

This paper analyzes some determinants of gain in computer literacy by over 300 high school students who were concurrently enrolled in a required 28-hour computer literacy course that substituted for every sixth mathematics class day throughout the year. Since several hundred students were enrolled in the course and there were only 11 Apple microcomputers in the Computer Center, it was not possible to assign homework requiring the use of a computer. Most students used the center to play games, although some went beyond classwork. Pretest and posttests determined computer literacy, experience, and attitudes toward computers. Gender, grade, mathematics course type and mathematics section type were all found to be related to gain: males, younger students, students in sophomore and junior college preparatory mathematics, and students in advanced sections of mathematics courses gained relatively more than females, older students, and students enrolled in other mathematics courses or section levels. Access to and experience with computers were generally unrelated to gain in computer literacy. Exceptions to this were that asking the teacher for help was a determinant of gain for female students, and access to a computer outside of school was a determinant of gain for ninth and tenth grade female subjects. (PN)

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An Empirical Study of Some Determinants of Microcomputer Literacy in High School Students

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Research on computers in education has focused on how computers are used in schools (Sheingold, 1981), on the effectiveness of computer-assisted instruction (Jamison, Suppes, & Wells, 1974; Ragosta, Holland, Jamison, 1981), and on the effectiveness of computer related courses on computer literacy (Klassen, Anderson, Hansen, & Johnson, 1980). No research to date has examined the relationship between the availability of computers in schools and home, student use of computers and student gains in computer literacy. The purpose of the present study is to identify the effects of these variables on student gains in computer literacy.

Until recently, the study of computers and programming languages were considered college level subjects, closely tied to main frame computing facilities. With the advent of the relatively low-cost, decentralized computing made possible by microcomputers, however, access to interactive computing is rapidly becoming commonplace in secondary schools. Along with the recent and widespread availability of microcomputers, the definitions of computer science and computer literacy have taken on a variety of new meanings, and the concepts themselves have been the focus of several national conferences. Although no consensus has been reached

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about the definitions of computer literacy (Johnson, Anderson, Hansen, & Klassen, 1980; Luehrmann, 1981; Seidel, Anderson, & Hunter, 1982), it may be considered analogous to language literacy. Thus levels of computer literacy may be seen as falling along a continuum ranging from knowledge of concepts and definitions (conversational level), to the ability to write simple or "cookbook" programs or adapt and run "canned" programs (reading level), to the ability to create new programs for solving diverse problems (fluency level). Computer literacy and computer awareness courses may be designed to bring students to any level along the continuum; fluency may not even be considered an eventual objective. Computer science courses, on the other hand, assume that fluency is both an objective and a prerequisite for continuing in the area.

No matter how computer literacy is defined, interest in computer literacy is spreading (Becker, 1982). The National Center for Educational Statistics recently reported that 50% of the nation's secondary schools provide students with access to an interactive system and that nearly 20% of the remaining districts planned to initiate secondary student use of computers within the next three years (Goor, 1981). The number of microcomputers in schools and homes continues to increase rapidly; the number of introductory courses to microcomputers, programming languages, and the use of commercial software is growing almost as rapidly. Students appear to be teaching themselves about computers in record numbers, motivated by the stimulating graphics, fast pace and immediate feedback of computer games. The Gallup National Youth Survey reported that in 1982, 93% of all youth aged 13-18 had played computer games and 55% expected to take computer courses in college (Bezilla, 1982).

Despite these rapid changes, there have been few empirical studies of computer literacy acquisition among high school students, and the relationship between student characteristics, computer use and the acquisition of computer literacy has not yet been empirically investigated. The purpose of this study is to answer the following questions:

1. What are the effects of student gender, grade and mathematics class placement on student gain in computer literacy?
2. What are the effects of student access to an use of computers on gain in computer literacy?

Method

During the academic year 1981-82, all students at a suburban, upper middle-class high school in central New Jersey who were enrolled either in first or second year general mathematics, or in first, second or third year college preparatory mathematics were concurrently enrolled in a required 28-hour computer literacy course that substituted for every sixth mathematics class throughout the year. Students were administered a 15-item test of computer literacy at the first session of the computer literacy course and at the final session; at the penultimate session they were administered a 37-item questionnaire regarding their experience and attitudes towards computers. Students completing all three instruments served as the sample for this study.

A. Measures

1. Computer literacy pretest and posttest

The same computer literacy instrument was used for both the pretest and posttest. It contained 15 items, evenly divided between general

computer knowledge, vocabulary, and programming algorithms.

Several items were adapted from the computer literacy test developed by the Minnesota Educational Computing Consortium (Klassen, Anderson, Hansen, & Johnson, 1980).

2. Computer survey

The survey instrument contained 37 questions regarding student access to and use of computers, student attitudes towards computers, and descriptive information such as grade, sex and mathematics course. In this paper six access and experience items were selected for analysis:

1. Had you ever used any kind of computer before taking this course?
2. Do you have access to a computer outside of school?
3. Did you come to the Computer Center this year only for class?
4. How often have you asked for help from the teacher during computer class?
5. How often have you played computer games, video games or arcade games?
6. How often have you programmed or used a computer for schoolwork outside of class?

Student descriptive information used in the analyses reported in the paper included gender, grade, mathematics course type (general or college preparatory mathematics), and mathematics section level (remedial, below average, average or advanced). A list of all variables and their operational definitions is presented in Table 1.

B. Computer Literacy Course

The goals of the computer literacy course were to acquaint students with the potentials and applications of microcomputers, to introduce

students to the BASIC programming language and to give students practice in elementary scientific method. The course was taught in the high school Computer Center by the Computer Center director; the Center itself contained 11 Apple microcomputers with disk drives which students used during class. When classes were not in session--before school for approximately 25 minutes, during the day for two hours and fifteen minutes and after school for forty five minutes--students were also permitted to use the microcomputers. Students were permitted to reserve a computer for programming, but not for games. Most of the students who availed themselves of the opportunity to use the Computer Center during these times played games, although there were some who used out of class time to go beyond the classwork and to complete programs.

The general pattern of the classes consisted of four steps. In each six-day cycle, the students were introduced to new concepts by watching a videotape made by the Computer Center Coordinator which superimposed relevant Apple programs on her video image, by a lecture or by a handout. The introduction to new concepts was followed by a discussion in which student's questions were answered and the classwork was explained. Using the new concepts, the students entered demonstration programs, ran them and made notes on their results. The students were then asked to write programs applying the concepts which had been presented.

During the year, it became evident that the approach described above was not appropriate for some of the classes. In these classes students needed to improve their skills, including the ability to concentrate. For this reason there were six classes in which the usual approach was modified. Materials were used which permitted students work at their own pace and a more individualized instruction method was used.

Results

Surveys were returned from 474 students, or 97.1% of those who received grades for the computer literacy course. After screening, usable data were obtained from 413 (87.1%) of the returned surveys; pretest scores were available for 345 (83.4%) of these respondents and posttest scores were available for 383 (92.5%). Complete pretest, posttest and survey data were available for 313 students. Respondents could be characterized as follows: 50% were female, 74% were ninth or tenth grade students, and 97% were enrolled in college preparatory mathematics courses.[1] (See Appendix A).

Because of these sample characteristics, the results of our analyses will be reported as three separate studies.

A. Study One: Differences by gender, grade and mathematics class for all respondents

The analyses in this section will examine the differences in computer literacy gain by student gender, grade, mathematics course type and mathematics section level for all students.

Pretest scores and survey data were available for 341 students, and posttest scores and survey data were available for 381 students. The mean pretest score for all students was 3.31 (S.D. = 1.97) and the mean posttest score was 7.30 (S.D. = 2.92), indicating an average gain on the computer literacy test of about four points. Means and standard deviations of pretest and posttest scores by student gender, grade, mathematics course type and mathematics section level are presented in Table 2.

Although posttest scores on the average were four points higher than pretest scores, four-point gains were not observed for all subgroups. Greatest discrepancies were found between students enrolled in college preparatory mathematics courses and those enrolled in general mathematics, and between those enrolled in advanced mathematics sections and those enrolled in remedial mathematics sections. Since simple gain scores (the difference between pretest and posttest scores) are relatively unstable, we computed adjusted gain scores (the difference between predicted posttest scores and actual posttest scores) to estimate the significance of these apparent differences in learning. The predicted posttest score was obtained from an ordinary least squares regression of pretest on posttest, which yielded the following prediction equation:

$$Y' = 0.4601X + 5.926$$

where Y' is the predicted posttest score and X is the pretest score. This equation was applied to each student's pretest score to yield the predicted posttest score. The student's predicted posttest score was then subtracted from his or her actual posttest score to yield an adjusted gain score:

$$G = Y - Y'$$

where G is the adjusted gain, Y is the students actual posttest score and Y' is his or her estimated posttest score.

The relationship between student gender, grade, mathematics course or mathematics section type and adjusted gain in computer literacy was explored by four one-way analyses of variance, conducted with adjusted gain as the dependent variable and the student characteristic as the independent variable. Results of these analyses are presented in Table 3.

Girls gained less than expected, while boys gained more than expected, a statistically significant main effect for gender, $F = 5.94$, $p < .02$, was found. Tenth grade students gained more than expected, while eleventh and twelfth grade students gained less than expected; a statistically significant main effect for grade, $F = 9.09$, $p < .001$, was found. Students enrolled in general mathematics and in freshman college preparatory mathematics gained less than expected, while students in sophomore or junior college preparatory mathematics gained more than expected; a statistically significant main effect for mathematics course type $F = 9.32$, $p < .001$, was found. Finally, students enrolled in accelerated mathematics classes gained more than expected, while students enrolled in average or remedial mathematics classes gained less than expected; a statistically significant main effect for mathematics section type, $F = 16.47$, $p < .001$, was found. In general, boys enrolled in advanced sections of sophomore and junior college preparatory mathematics courses achieved the greatest gain in computer literacy.

B. Study Two: Some determinants of computer literacy gain for all respondents

We hypothesized that computer literacy gain would be a linear additive function of access to computers, and experience with computers, net of the exogenous factors of gender, grade, and mathematics course type and mathematics section level analyzed in the previous section. The independent variables included the six indicators of computer access and experience and eight indicators of student characteristics described in Table 1. The dependent variable was the student's spring achievement

score on the computer literacy test. So that we could measure the gain from fall to spring, we used the fall score on the computer literacy test as a control variable. This lagged regression procedure is preferable to the use of actual gain scores as the output measure because gain scores have greater measurement instability (Bohrnstedt, 1969). We used ordinary least squares regression analysis to estimate the results (see Table 4).

1. Effects of access, use and experience

Of the six indicators of computer access and experience--prior use of computers, access to a computer outside of school, use of computer during class time only, use of computers for schoolwork, asking the teacher for help with the computer, and electronic game playing--only asking the teacher for help was significantly related to computer literacy gain; with other variables held constant, students who asked more questions gained relatively more than students who asked fewer questions.

2. Gender differences

Hypothesized gender differences in access to and use of computers (Sheingold, 1981) and our finding of sex differences in achievement gain led us to repeat the preceding analyses separately by sex. The results are presented in the second and third columns of Table 4.

Access and experience. None of the access and experience variables--including asking the teacher for help--were important determinants of male achievement gain; for female students, asking the teacher for help had a positive and significant effect.

Student characteristics. Five of the six grade level and mathematics class type variables were significant predictors of achievement gain for

female students, but ony two of these variables were significant predictors of achievement for boys. Enrollment in an advanced section of mathematics was not a statistically significant predictor of achievement gain for either girls or boys.

C. Study Three: Ninth and Tenth Grade Students only

We noted at the outset that nearly three-fourths of the students in the respondent pool were ninth and tenth graders. Since anecdotal reports suggest that younger high school students use computers for recreation more than older high school students, use of and access to computers may have been confounded in this data by grade. We decided to aggregate ninth and tenth grade data and analyze it separately to see if any use and access variables would be related to computer literacy gain for these younger students.

In conducting this analysis, we redefined our variables slightly. First, we omitted "prior use of computers" since it had not proven a statistically significant predictor of achievement gain and the majority of these younger students had been exposed to computers in junior high school. Second, we computed a new variable to take into account the fact that many ninth and tenth grade students were enrolled in a mathematics class that was one or two years "ahead" of their expected placement: 35% of the freshmen were enrolled in either sophomore or junior college preparatory mathematics, and 19% of the sophomores were enrolled in junior college preparatory mathematics. As most students who were thus accelerated were placed in an advanced section of the course, as well, the newly created variable substituted for the mathematics course type and section

level used previously. We then conducted regression analyses similar to those reported above; the results are presented in Table 5.

1. Effects of Access, Use and Experience

Four access and experience variables were included in the multiple regression: access to a computer outside of school, out-of-class use of school computers, electronic game playing, and asking the teacher questions. Of these, only access to a computer outside of school and asking the teacher for help were significantly related to gain in computer literacy for ninth and tenth grade students. Students who reported having access to a computer outside of school gained nearly one full point more than those who did not report having such access, and students who asked teachers for help gained more than those who did not.

2. Student Characteristics

Holding constant pretest score, both student gender and placement in an accelerated mathematics class were related to gain in computer literacy. Females gained about eight-tenths of a point less than boys, while those in accelerated classes gained over two points more than those in grade-appropriate mathematics classes.

3. Gender Differences

Because significant gender differences were observed, regressions were run separately for male and female students. These analyses showed that the effects of access to a computer and increased teacher-student interaction were statistically significant and positive for girls only. Female students with access to a computer outside of school gained one

and one-quarter points more than those not reporting such access. Also, female students who asked the teacher for help gained about three-quarters of a point more than those who did not ask the teacher for help.

Placement in an accelerated mathematics class was significantly related to gain in computer literacy for both male and female students, but the size of the effect was greater for female students. Female students in accelerated mathematics classes gained over 2.5 points--a full standard deviation--more than those in nonaccelerated mathematics classes. Male students in accelerated mathematics classes gained about 1.8 points more than those in non-accelerated classes.

Experience and access variables explained a higher proportion of variance in computer literacy for females (r^2 = .083) than for males (r^2 = .000). Moreover, less variance in posttest score was explained by female pretest score (r^2 = .060) than by male pretest score (r^2 = .144), suggesting that the learning by female students was distributed more evenly across all students instead of somewhat more strongly associated with higher pretest achievers, as with the male students.

Summary

In this paper we have analyzed some determinants of gain in computer literacy by high school students. Gender, grade, mathematics course type and mathematics section type were all found to be related to gain: males, younger students, students to sophomore and junior college preparatory mathematics, and students in advanced sections of mathematics

courses gained relatively more than females, older students, and students enrolled in other mathematics courses or section levels. Access to and experience with computers were generally unrelated to gain in computer literacy; exceptions to this were that a) asking the teacher for help was a determinant of gain for female students, and b) access to a computer outside of school was a determinant of gain for ninth and tenth grade female students.[2] These findings raise several questions that will be discussed in this section.

1. Why were mathematics courses and section such important determinants of computer literacy achievement gains? That is, why did students with comparable pretest scores gain so much more when placed in advanced or accelerated mathematics sections?

One obvious explanation is that the students in these classes were simply more able than those in the other classes, and that their gain reflected this ability. In the multivariate regression analysis, however, we controlled for the student's initial level of computer literacy; the indicators of mathematics class characteristics (course type, section level, accelerated mathematics) could be viewed, therefore, not only as indicators of student ability but also as indicators of the ability of the other students in the particular computer literacy class. We saw in Table 1 that the pretest scores of students in sophomore or junior college preparatory mathematics classes and in advanced sections of mathematics were higher than students in other courses or sections. Because the students in these courses or sections were more computer literate than the students in other courses or sections, they were more

able to give help and assistance to their less literate classmates. In Table 2, we saw that students in these courses and sections achieved greater-than-predicted gain in computer literacy, in comparison with students in other courses or sections whose gain was close to that predicted for them. This may have been due to the presence of computer "buffs"--highly computer literate students--who acted as teachers.

Student computer "buffs" have been observed to take a major role in educating fellow students (Sheingold, 1981), and group learning has been seen to be a common practice in courses dealing with computers, particularly when there are fewer computers than students, as in the classes under investigation. Because there were more computer "buffs" in the advanced sections of sophomore and junior college preparatory mathematics in this high school (about 80% of the "buffs,"--defined as students scoring in the top 5% on the pretest--were in these classes), we speculate that they were serving as student teachers in these classes, providing help to peers and generally contributing to the computer literacy gain of their classmates; "buffs," themselves, did not experience greater-than-predicted gain in computer literacy, however.[3]

2. Why was there a gender difference in computer literacy gain, when there was no gender difference in pretest computer literacy?

There are many possible explanations for this difference, including gender differences in access and use of computers and gender differences in motivation. Since access and use variables accounted for some variance in the computer literacy gain for ninth and tenth grade girls--although

these variables did not account for differences in gain among boys--it is possible that with greater access and more use the overall gender difference would disappear. Another possible explanation is that the girls did not receive as much instruction from student computer "buffs" as did their male classmates, and hence their overall opportunity for learning was less.

In general, we know that small group learning in school settings primarily occurs in same-sex groups (Lockheed, in press). We also know from an inspection of the scores on the pretest that only three girls compared to 17 boys could be considered "buffs" in this sample. Thus, girls who were not "buffs" would not have the same chance of learning from a same-sex "buff" as would boys. Although it is possible that girls might seek information from male "buffs" in their classrooms, Webb (1982) has shown that in high school mathematics classes male students do not respond to female classmates' requests for help on mathematics; it seems quite likely that they would not respond to female classmates' requests for help in computer science as well.

3. Why were the access and experience variables so little related to computer literacy gain, when the popular literature is so full of statements linking the two?

There are several explanations for these findings. First, we noted that access to a computer outside of school was only modestly rather than strongly related to computer literacy gain. This may have been due to the nature of the course. Since several hundred students were enrolled in the course and there were only eleven computers in the Computer

Center, it was not possible to assign homework requiring the use of a computer. Homework could not serve as a substitute for classwork, and a home computer, therefore, would not assist a student in completing his or her classwork. Although we anticipated that access to a home computer would help a student learn to program--reasoning by analogy that if possession of books in a home helps a student develop reading skills, possession of a home computer would help a student develop programming skills--this was not the case. There may be two reasons for this. One is that the analogy between books and reading and computers and programming may be false, and that the analogy is more correctly: books are to reading as computers are to computer use--not to programming. Moreover, access to a home computer may lead to playing arcade type games, which activity we found to be unrelated to gain on our measure of computer literacy.

Second, we also found that extracurricular use of the Computer Center had no effect on computer literacy gain. Although any student could come to the Computer Center after school, before school, or during a free period to use the computers, relatively few (22.7%) students took advantage of this opportunity and even fewer (2.2%) reported having reserved a computer for programming more than once or twice; 80.5% reported never having reserved a computer for programming. Instead, most of the students chose to play arcade-type games and did not use the time for programming. Question for further study include: Would extracurricular computer use be more strongly related to gain in computer literacy if computers were made available only for programming? To what extent would restricting

the use of computers to programming increase or decrease the extracurricular use of the Computer Center by students?

Third, there has been much speculation that playing computer games promotes computer literacy; we did not find evidence for this speculation. Most of the students who played games played arcade-type games such as "Pac-Man" or "Space Invaders." It is possible that playing adventure games, such as "Adventureland" or "Mission Impossible Adventure," could improve logical thinking and therefore have an effect on programming skills. In our data, however, we were unable to distinguish between the effects of arcade-type games and the effects of adventure games. This would be an interesting area for further inquiry.

Footnotes

[1]In addition, 23% of the respondents were enrolled in an advanced mathematics section and 22% had accelerated at least one year ahead in mathematics.

[2]A simple adjusted-gain analysis showed that for all students, those with access to a computer gained .91 of a point more than those without access ($F = 7.314$, $p < .01$); for females, those with access to a computer gained 1.14 points more than those without access ($F = 5.178$, $p < .03$). A simple adjusted-gain analysis showed no effect for asking teachers a question on gain: $F = 0.91$ ($p < .45$) for all students and $F = 2.211$ ($p < .07$) for females.

[3]Although "buff" status and pretest score were highly correlated ($r = .63$), the correlation between "buff" status and posttest score was much less ($r = .28$); both were, however, statistically significant. A multiple regression indicated, however, that the effect of "buff" status on posttest, net of pretest, was not statistically significant ($t = 1.42$; $p > .05$).

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Table 1

Variables and Measures

Pretest/Posttest	Score on 15-Item Computer Literacy Test
Gender	Indicator (1 = male, 2 = female)
Grade 10	Indicator (1 = grade 10, 0 = other grades)
Grade 11	Indicator (1 = grade 11, 0 = other grades)
Grade 12	Indicator (1 = grade 12, 0 = other grades)
College Prep. Math I	Indicator (1 = enrollment in freshman mathematics, 0 = other)
College Prep. Math II	Indicator (1 = enrollment in sophomore mathematics, 0 = other)
College Prep. Math III	Indicator (1 = enrollment in junior mathematics, 0 = other)
General Math I or II	Indicator (1 = enrollment in general math, 0 = other)
Advanced Math Section	Indicator (1 = enrollment in advanced math section, 0 = enrollment in regular, below average or remedial math section)
Prior Use	Indicator of prior computer use (1 = yes, 0 = no)
Outside Access	Indicator of outside access to a computer (1 = yes, 0 = no)
Class Use Only	Indicator of computer use in class only (1 = yes, 0 = no)
Use for Schoolwork	5-point scale of frequency of computer use for schoolwork (1 = never, 5 = several times a week)
Ask Teacher for Help	5-point scale of frequency of asking teacher for help (1 = never, 5 = several times during each day)
Play Games	5-point scale of frequency of playing computer games (1 = never, 5 = several times a week)
Accelerated Math Class	Indicator (1 = if freshman in sophomore or junior mathematics or if sophomore in junior mathematics; 0 = other)

Table 2

Computer Literacy Pretest and Posttest Scores, by Gender, Grade, Math Course Type and Math Section Type

	Pretest			Posttest		
	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.
Gender						
Male	174	3.49	2.21	191	7.68	3.04
Female	170	3.12	1.69	190	6.92	2.74
Grade						
Ninth	134	3.36	1.92	149	7.23	2.79
Tenth	116	3.65	2.14	124	8.09	3.02
Eleventh	68	3.10	1.81	72	6.62	2.83
Twelfth	24	2.46	1.35	27	5.30	1.68
Math Course Type						
College Prep. I	101	2.87	1.66	111	6.11	2.23
College Prep. II	140	3.52	2.05	160	8.11	2.99
College Prep. III	87	3.55	2.10	90	7.93	2.91
General I	4	2.50	2.08	8	4.37	1.92
General II	10	2.90	1.79	9	4.56	2.19
Math Section Type						
Below average	66	2.67	1.42	68	5.50	2.55
Advanced	77	4.18	2.31	85	9.27	3.03
Average	175	3.30	1.89	193	7.38	2.48
Remedial	7	1.86	1.22	10	5.10	2.38

Table 3

Simple and Adjusted Gain Scores on Computer Literacy Test, by Gender, Grade, Math Course Type and Math Section Type

	Simple Gain	Adjusted Gain	F	Sig.
Gender				
Male	4.19	0.37	5.94	$p < .02$
Female	3.80	-0.38		
Grade				
Ninth	3.97	-0.07	9.09	$p < .001$
Tenth	4.44	0.89		
Eleventh	3.52	-0.63		
Twelfth	2.84	-1.89		
Math Course Type				
College Prep. I	3.24	-1.04	9.32	$p < .001$
College Prep. II	4.59	0.72		
College Prep. III	4.38	0.41		
General I	1.87	-2.58		
General II	1.66	-2.65		
Math Section Type				
Below average	2.83	-1.73	16.47	$p < .001$
Advanced	5.09	1.47		
Average	4.08	0.08		
Remedial	2.72	-0.64		

Table 4

Gender, Grade, Mathematics Class, Computer Access and Computer Use Effects on Computer Literacy Gain by High School Students

Variables	All students (N = 311)		Boys only (N = 159)		Girls only (N = 152)	
	B	t	B	t	B	t
Pretest score	.243	3.207**	.270	2.570*	.200	1.673
Gender (female)	-.701	2.078*	-	-	-	-
Prior use (1)	.180	.616	-.411	.885	.580	1.355
Outside access (2)	.446	1.271	.469	.944	.624	1.204
Class only use (13)	.102	.257	-.170	.360	1.084	1.072
Use for schoolwork (18)	-.042	.200	-.085	.348	.049	.105
Ask for teacher help (19)	.306	2.645**	.097	.656	.713	3.707***
Play games (20)	.175	1.244	.256	1.283	.050	.241
Grade 10	-.021	.173	.244	.394	-.186	.341
Grade 11	-1.896	3.592***	-1.396	1.784	-2.00	2.654**
Grade 12	-3.115	4.385***	-3.130	2.890**	-2.93	2.991**
College Prep. Math I	-1.829	4.465***	-2.109	3.456***	-1.497	2.639**
College Prep. Math III	.841	2.019*	.230	.394	1.388	2.297*
General Math I or II	-2.424	3.093**	-2.958	1.934	-2.378	2.539*
Advanced math section	.842	2.211*	.931	1.732	.987	1.785
Constant	5.877	--	6.788	--	2.508	--
R^2	.354	--	.372	--	.373	--
R^2	.321	--	.311	--	.309	--

*p < .05
**p < .01
***p < .001

Table 5

Some Determinants of Computer Literacy Among 9th and 10th Grade Students

Variables	All Students (N=231) (1)	(2)	(3)	Boys (N=117) (1)	(2)	(3)	Girls (N=114) (1)	(2)	(3)
Pretest score	0.497**	0.345**	0.295**	0.513**	0.414**	0.357**	0.409**	0.238*	0.124
	(5.61)	(4.00)	(3.38)	(4.53)	(3.69)	(2.98)	(2.87)	(1.748)	(0.92)
Sex (female)		-0.805*	-1.020*		-	-		-	-
		(2.38)	(2.41)		-	-		-	-
Accelerated math class		2.128**	2.120**		1.823**	1.860**		2.492**	2.565**
		(5.61)	(5.62)		(3.43)	(3.44)			1.264**
Access to computer outside class			0.978*			0.741			1.264**
			(2.53)			(1.29)			(2.42)
Class use of computer only			0.499			0.510			0.098
			(1.09)			(0.93)			(0.09)
Games			0.126			0.271			-0.033
			(0.75)			(1.05)			(0.15)
Teacher help			0.229*			-0.034			0.781**
			(1.66)			(0.18)			(3.56)
Constant	6.168	7.248	5.826	6.517	6.289	5.007	6.032	5.875	2.750
R^2	.121	.246	.280	.151	.231	.258	.069	.217	.323
$\hat{R}^2$	.117	.236	.258	.144	.218	.218	.060	.202	.285

Note. * $p < .05$

** $p < .01$

Appendix A

Characteristics of Respondents

	N[a]	Percent[b]
Gender		
Male	206	49.9
Female	207	50.1
Grade		
8	6	1.5
9	156	30.1
10	135	33.0
11	84	20.5
12	28	6.8
Math Course Type		
General Math I	8	2.0
General Math II	12	2.9
College Prep. Math I	118	28.9
College Prep. Math II	171	41.8
College Prep. Math III	100	24.4
Math Section Level		
Below average	77	20.0
Advanced	89	23.1
Average	209	54.3
Remedial	10	2.6

Appendix A (Cont'd)

Characteristics of Respondents

	N[a]	Percent[b]
Pretest Score		
0-2	138	40.0
3-5	166	48.1
6-8	32	9.2
9-11	9	2.6
12-15	0	0
Posttest Score		
0-2	10	2.7
3-5	108	28.3
6-8	134	35.1
9-11	102	26.6
12-15	28	7.4

Note. [a]Totals may vary due to missing data.

[b]Percentages are based on number of respondents.